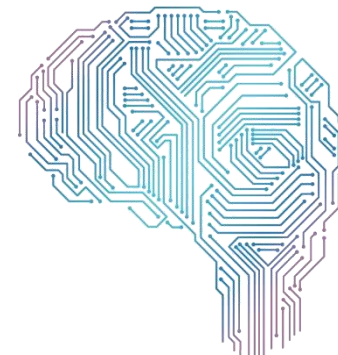




THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE



Analysing Daily Activity Logs for Smart Interaction

TRAN Minh-Triet
University of Science
Vietnam National University-Ho Chi Minh city





Agenda



❖ Introduction:

- Smart Environment and Smart User
- Daily Activity Logs

❖ Analyzing Daily Activity Logs for Smart Interaction:

- Augmented data/services by recognizing the current context and retrieving similar known cases.
- Find lost items, retrieve or verify memories by searching daily logs.
- Reminiscence can help people to positively revive past memories and connections with their relatives.
- Detect regular events and anomalies from surveillance systems or sousveillance archives for appropriate actions.
- Event simulation in virtual or mixed reality environments can be generated from real life data for education and training.

❖ Conclusion



Lifelogging Data?



April 15, 2018 at Hoan Kiem lake



April 15, 2018, at Bach Ma (White Horse) Temple



April 15, 2018 near Hoan Kiem lake



May 8, 2018 in Old Quarter, Hanoi



Introduction



Smart City



Smart Citizen



Smart Environment

- Provide smart features, utilities, services
- Collect & process information
- Provide infrastructure & support for further development

Smart User

- Exploit smart features, utilities, services
- Contribute information
- Develop utilities, ecosystem, community





Daily Activity Logs



Official/Public Systems



Surveillance

Personal/Private Systems



Sousveillance

Sousveillance with wearable cameras



Mann 1998 Microsoft 2004 Memoto 2013



Daily Activity Logs



- ❖ Wide variation of **data types** and **data sources**
 - Visual data
 - Audio data
 - Text data
 - Information from various sensors
 - Personal biometrics
 - Human activities
 - ...



Multi-disciplinary Field of Research



- ❖ **Multimedia Analytics:** A variety of data, different timings, different accuracies, needing different tools.
- ❖ **Information Retrieval:** Scalable & efficient indexing with contextual querying and no defined unit of retrieval.
- ❖ **Human Computer Interaction:** Develop fixed and ubiquitous capture & access methods for all stakeholders.
- ❖ **Pervasive Computing:** Use-cases need pervasive access and contextual querying.
- ❖ **Ethics & Privacy:** The ethics of how to use rich personal data & doing so in a privacy-aware manner
- ❖ **Ethinography:** The customs of individual peoples and cultures.
- ❖ **Memory**



THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE



Augmented data/services
by recognizing the current context
and retrieving similar known cases



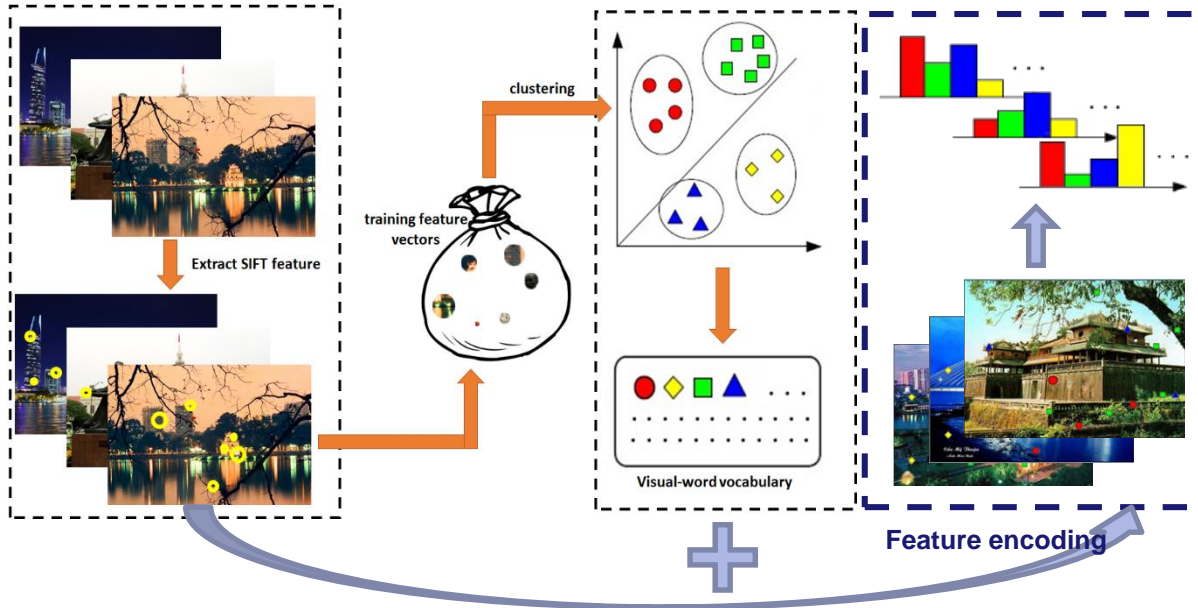


Landmark Recognition for Tourism

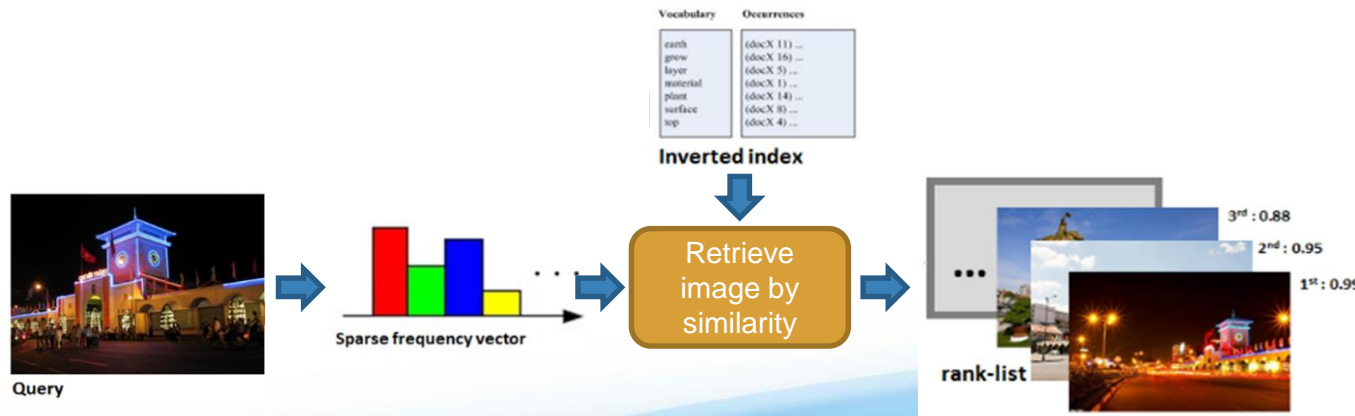




Traditional & Common Approach



Bag of Visual Words

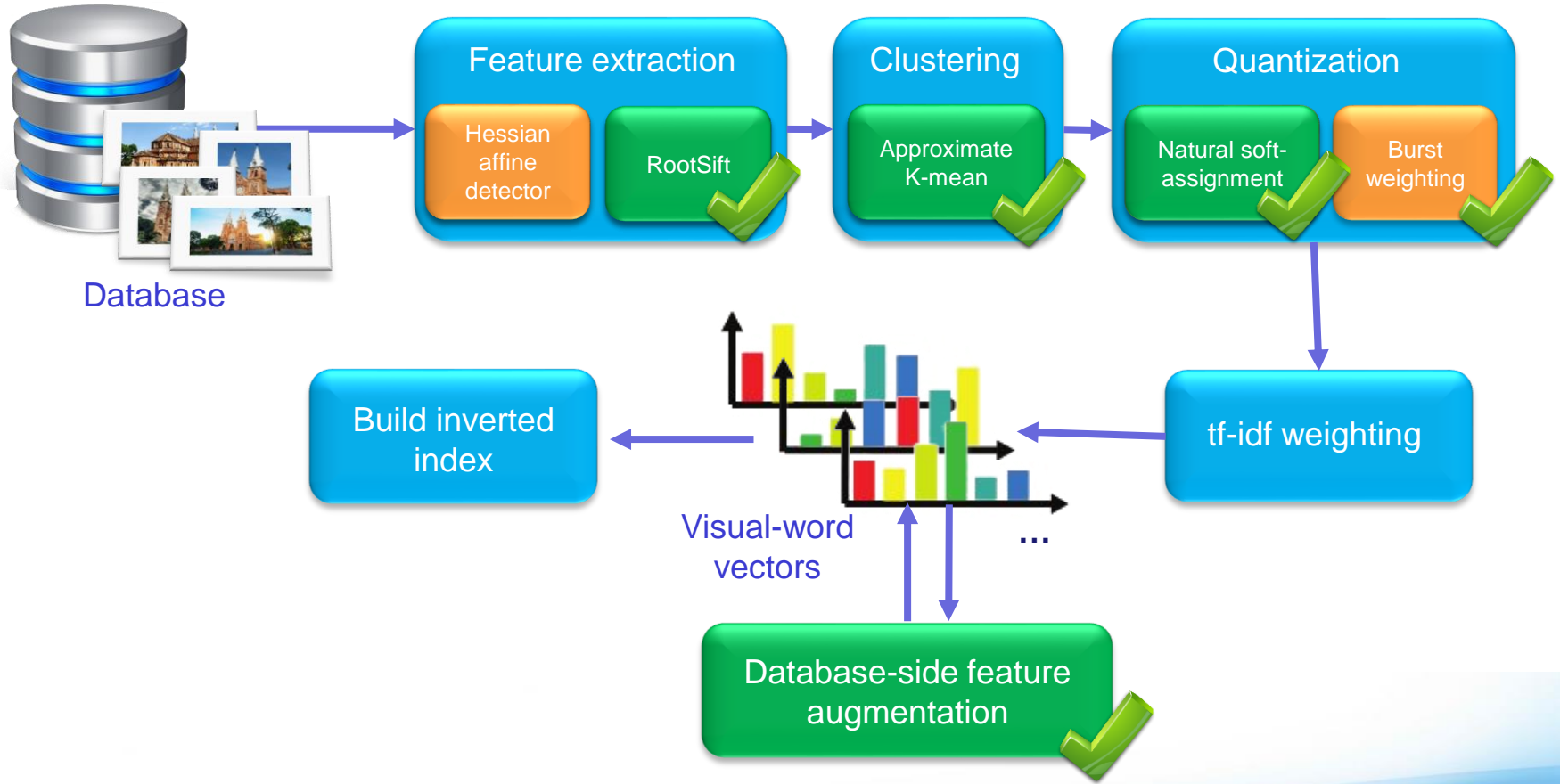




BoVW Framework for Visual Retrieval



BoVW Framework - Indexing



Josef Sivic and Andrew Zisserman, [Video Google: A Text Retrieval Approach to Object Matching in Videos](#), ICCV 2003

James Philbin, Ondřej Chum, Michael Isard, Josef Sivic and Andrew Zisserman, [Object retrieval with large vocabularies and fast spatial matching](#), CVPR 2007

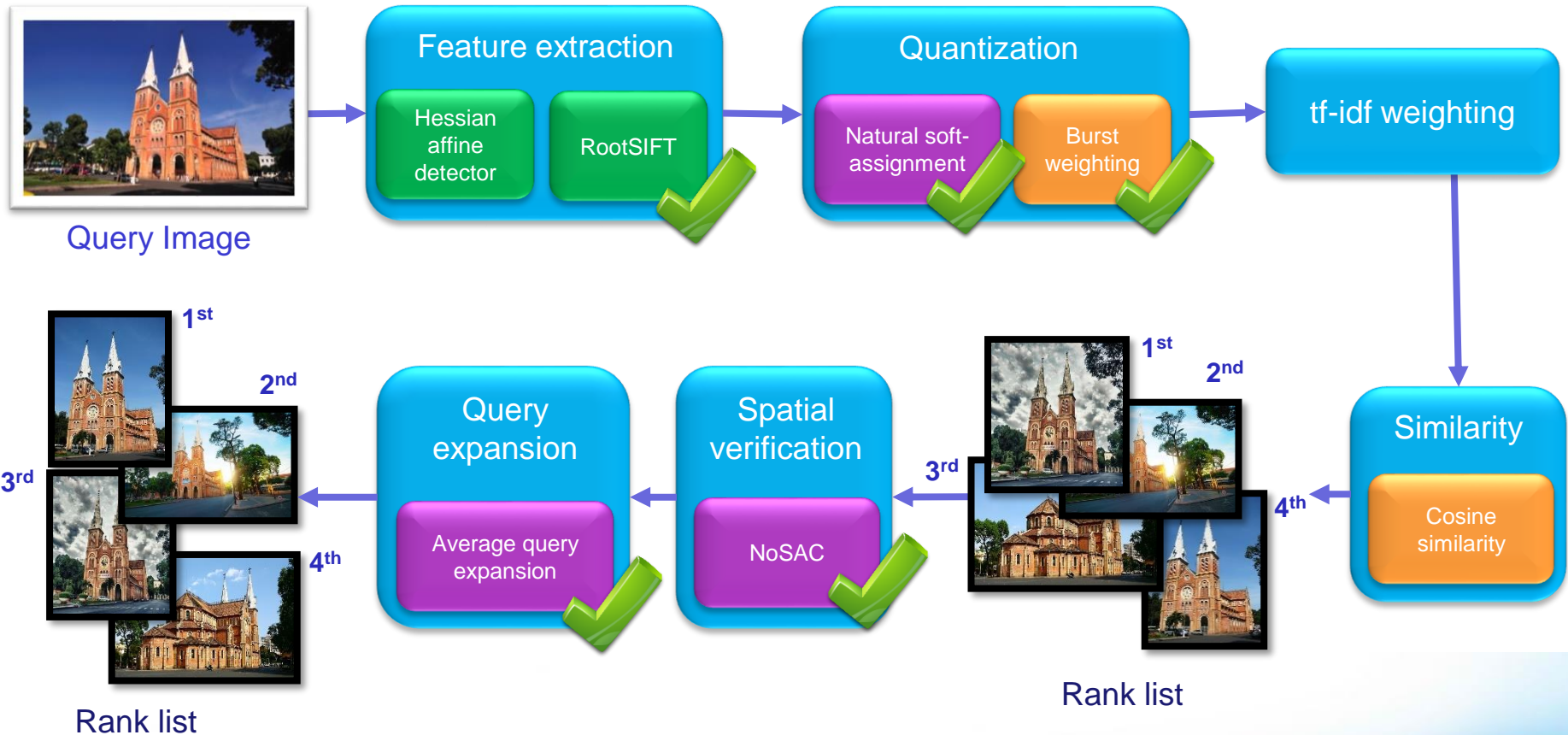
Relja Arandjelović and Andrew Zisserman, [Three things everyone should know to improve object retrieval](#), CVPR 2012.



BoVW Framework for Visual Retrieval



BoVW Framework - Retrieval



Josef Sivic and Andrew Zisserman, *Video Google: A Text Retrieval Approach to Object Matching in Videos*, ICCV 2003
 James Philbin, Ondřej Chum, Michael Isard, Josef Sivic and Andrew Zisserman, *Object retrieval with large vocabularies and fast spatial matching*, CVPR 2007
 Relja Arandjelović Andrew Zisserman, *Three things everyone should know to improve object retrieval*, CVPR 2012.



Landmark? Where am I?




Landmark retrieval and recognition: Challenging Problem!

Research Prediction Competition

Google Landmark Retrieval Challenge
Given an image, can you find all of the same landmarks in a dataset?

Google · 155 teams · 14 days to go (7 days to go until merger deadline)

\$2,500
Prize Money




<https://www.kaggle.com/c/landmark-retrieval-challenge>

Research Prediction Competition

Google Landmark Recognition Challenge
Label famous (and not-so-famous) landmarks in images

Google · 362 teams · 14 days to go (7 days to go until merger deadline)

\$2,500
Prize Money



<https://www.kaggle.com/c/landmark-recognition-challenge>



Who am I? Smart Identity-based Authentication

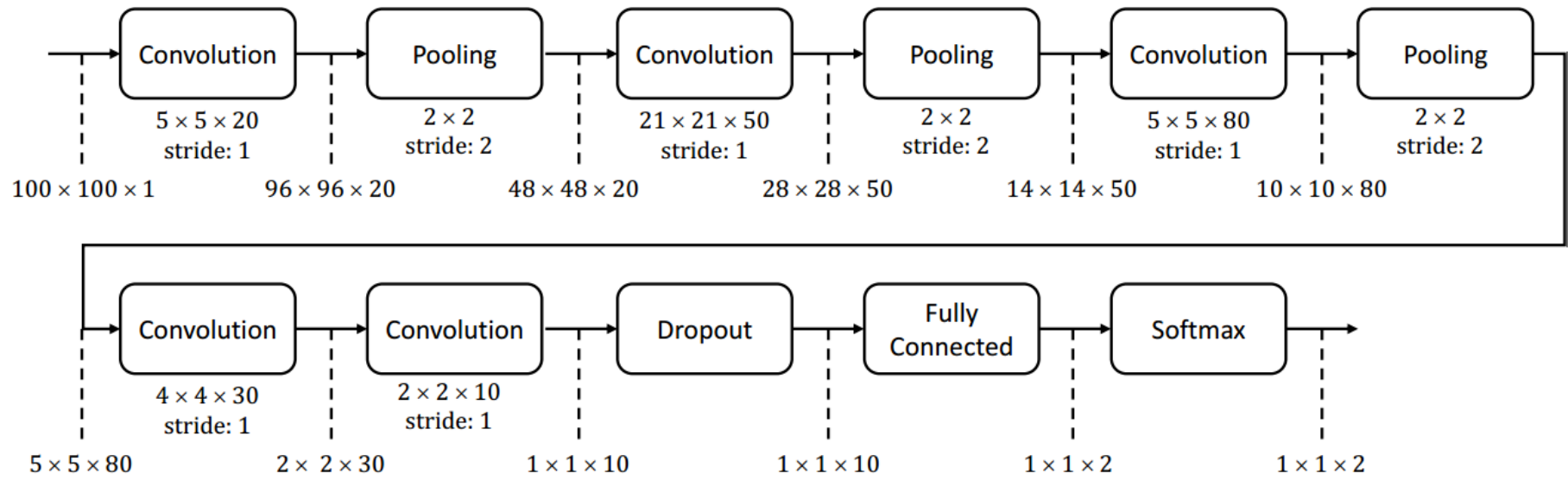




Face Authentication



Conventional CNN approach?





Domain Adaptation?



Illuminations



Camera parameters



Aging



Making up

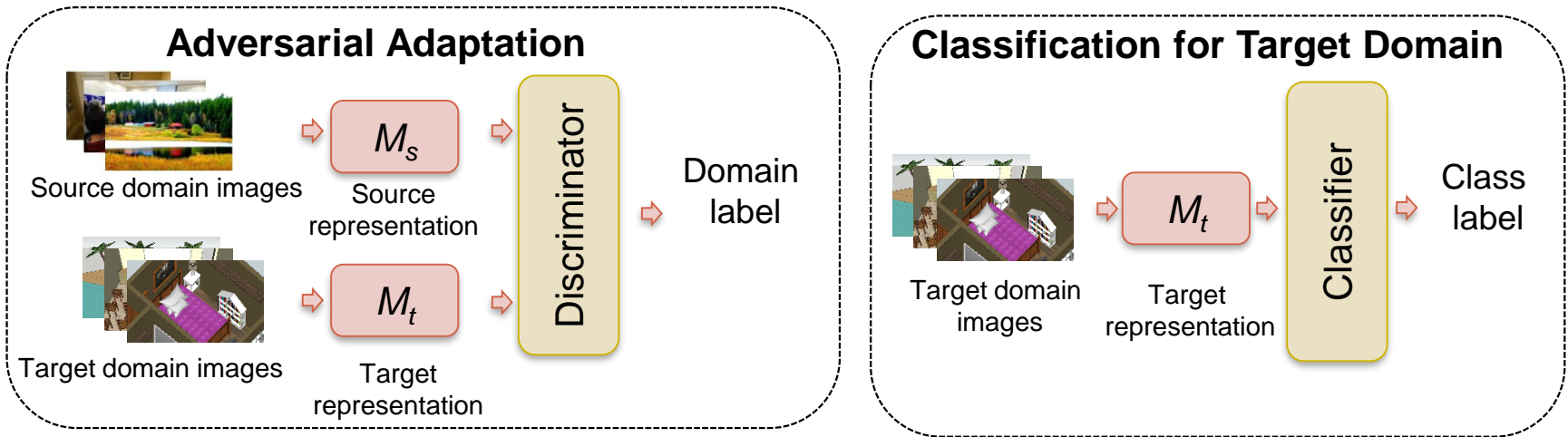




Domain Adaptation?



Adversarial adaptation for face recognition



Goal: to learn M_t so that the discriminator **cannot** distinguish the domain of a feature vector encoded by either M_s or M_t .



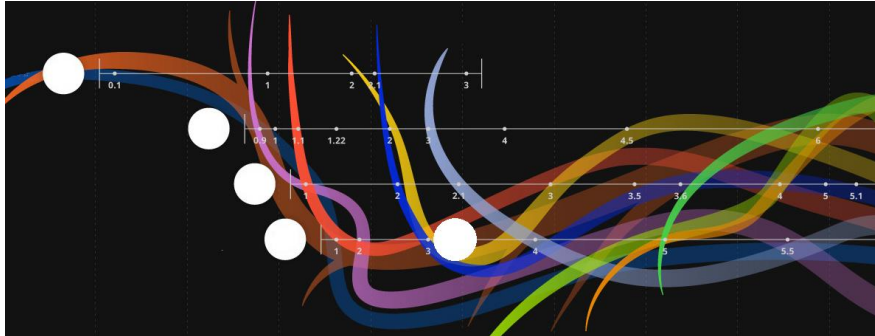
What transformations? How to transform?



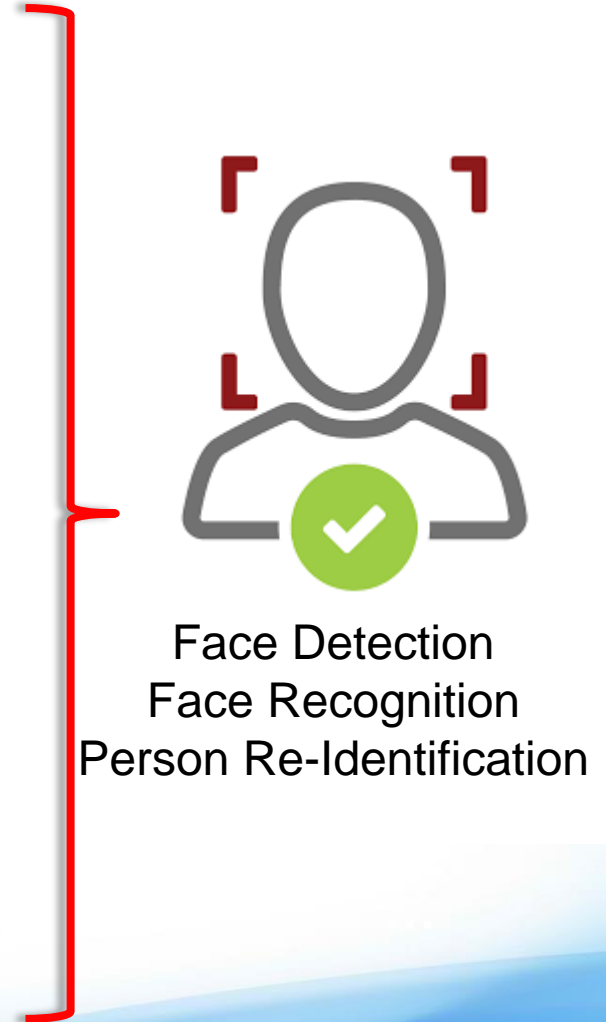
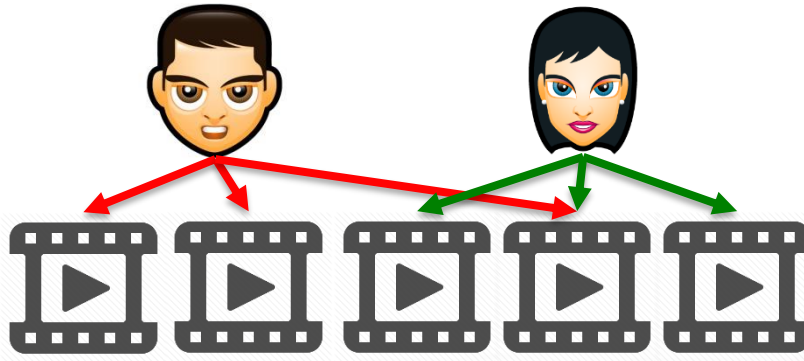
Face Recognition & Clustering for Image & Video Retrieval



- Character Flows in Video Sequence



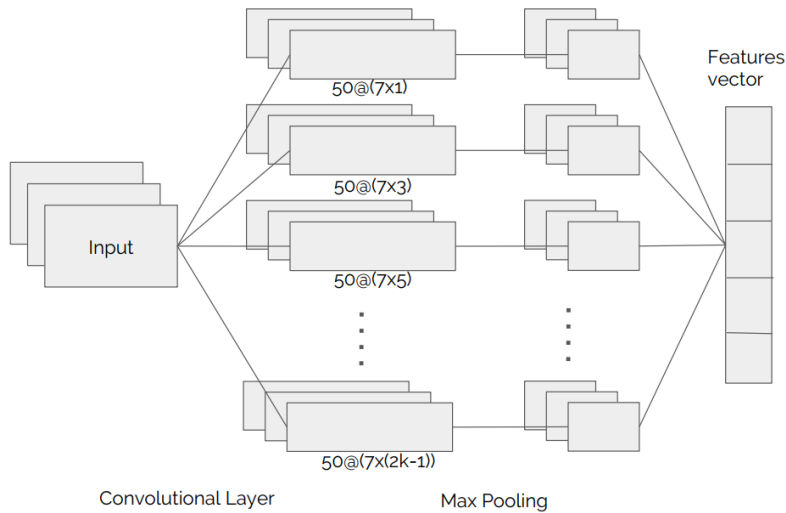
- Person-based Video Navigation



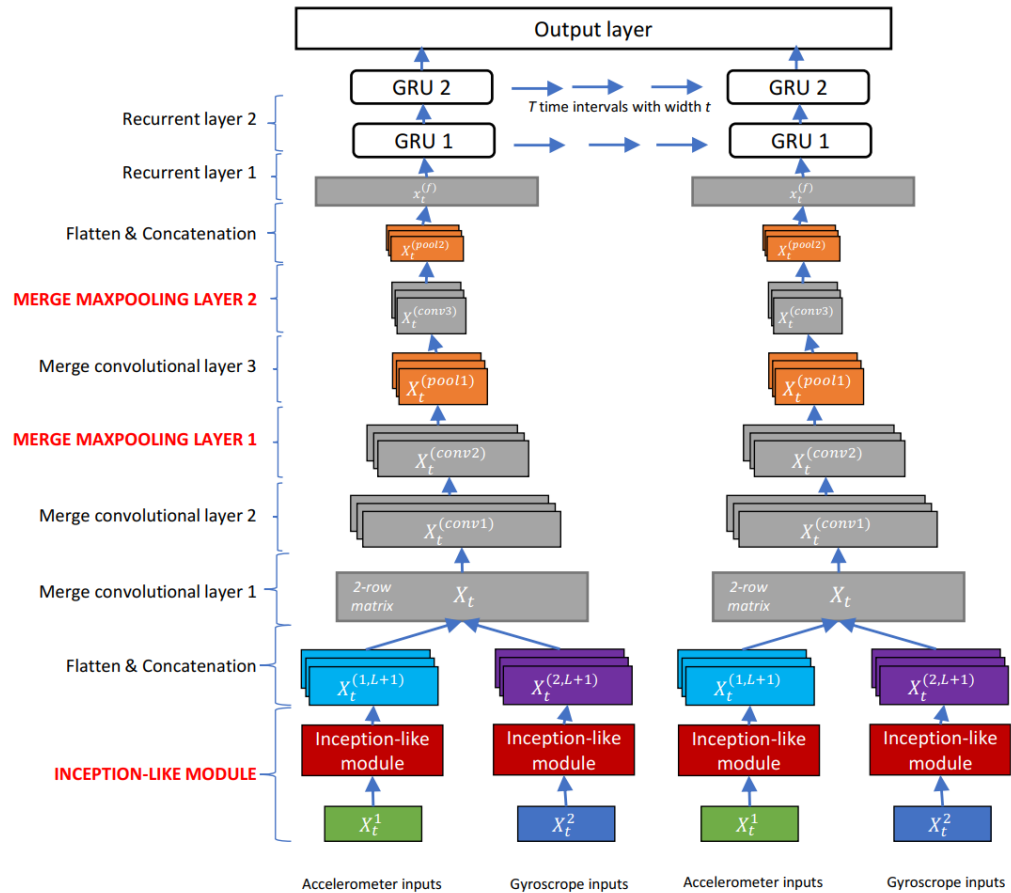
Face Detection
Face Recognition
Person Re-Identification



(Inertial) Gait-based Authentication



Multi-region Size CNN
for Short-Period
Gait-based Authentication



DeepSense-Inception for Multi-
Period Gait-based Authentication

Khac-Tuan Nguyen, Thanh-Luong Vo-Tran, Dat-Thanh Dinh, and Minh-Triet Tran, *Gait Recognition with Multi-Region Size Convolutional Neural Network for Authentication with Wearable Sensors*, FDSE 2017

Ha V. Hoang, Minh-Triet Tran, *DeepSense-Inception: Gait Identification from Inertial Sensors with Inception-like Architecture and Recurrent Network*, CIS 2017



Personalized Smart Advertisement





Augmented Reality-based Shopping Assistance

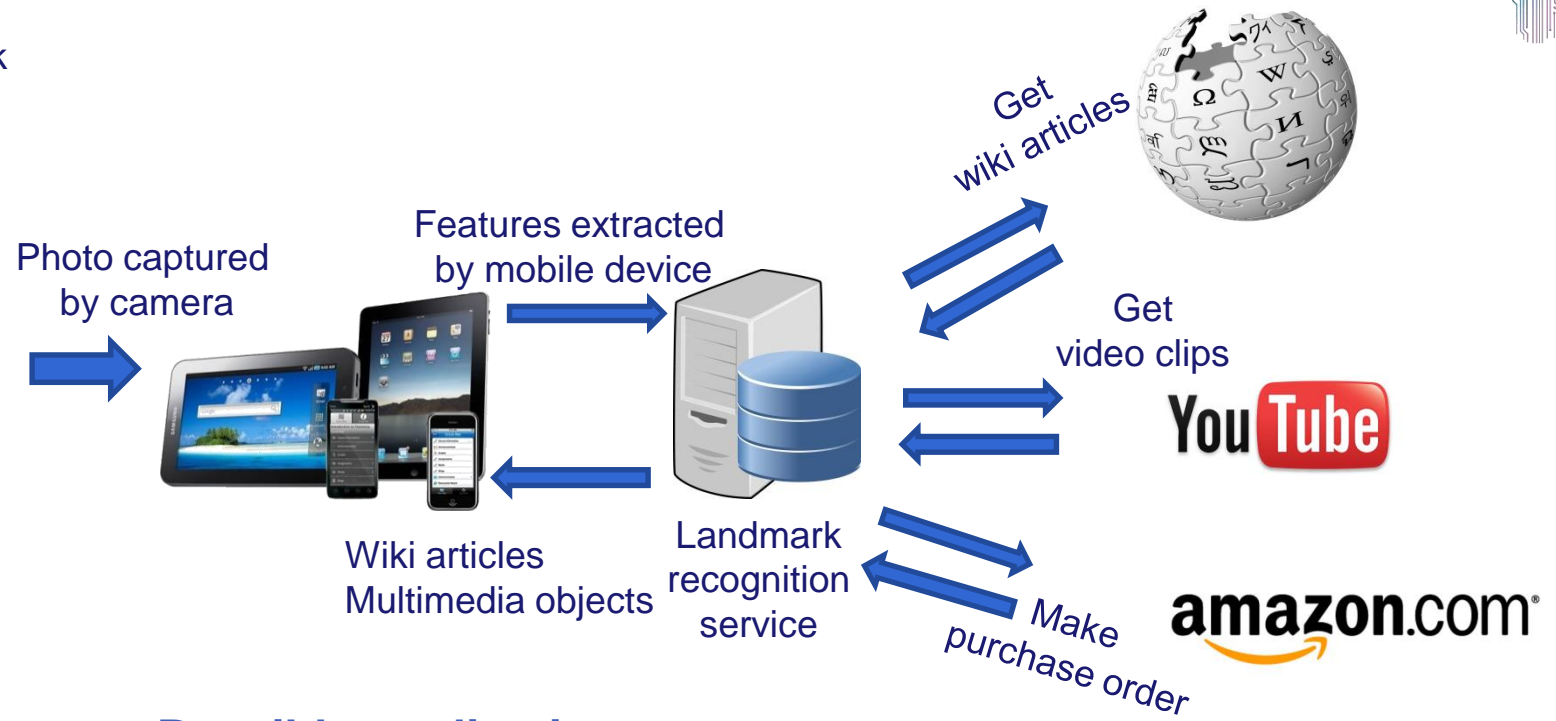




Personalized Smart Shopping



Product/Book



Possible applications:



Online community of customers



m-commerce

...

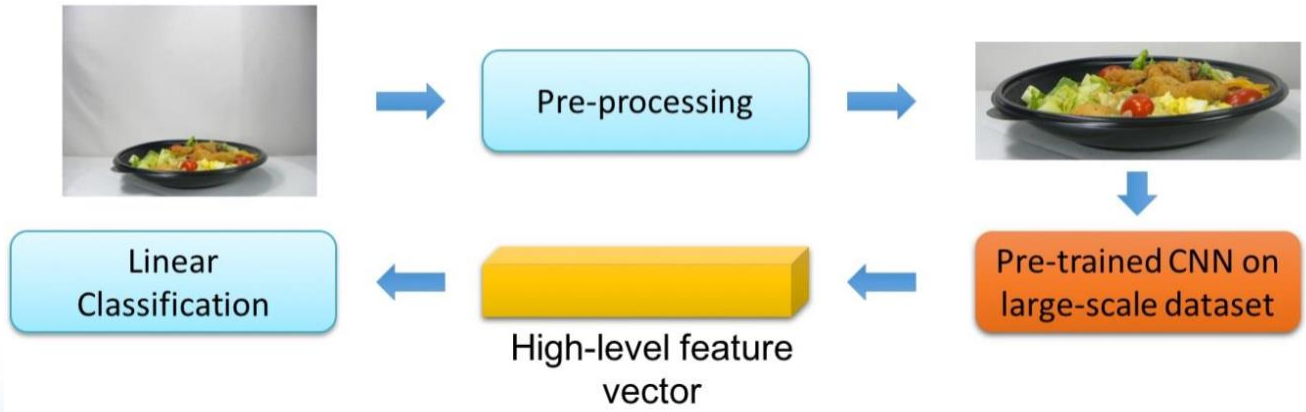
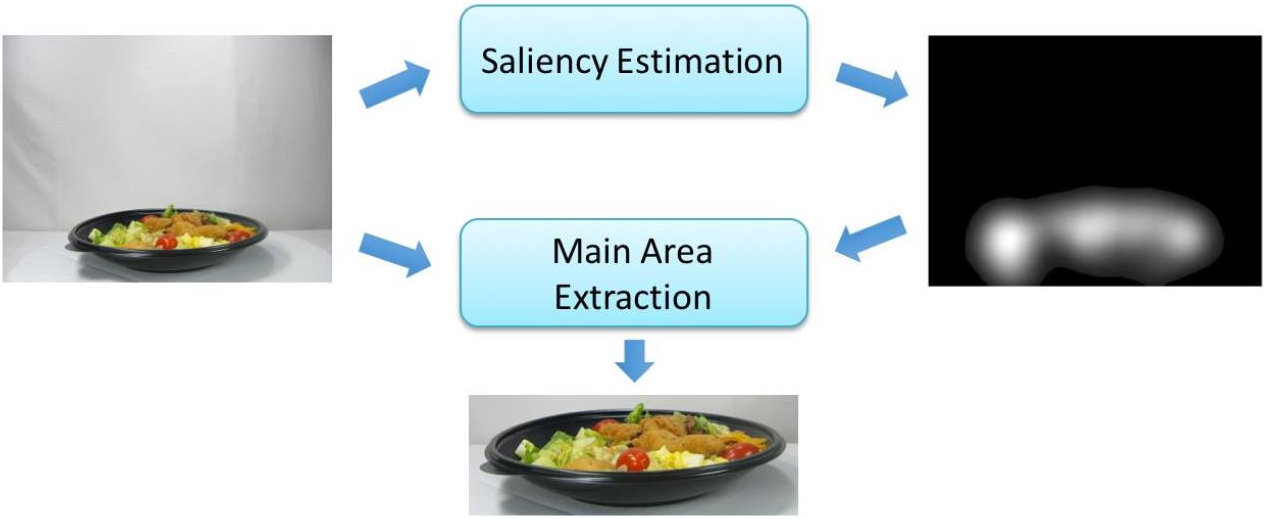


Food Recognition & Recommendation





Food Recognition & Recommendation



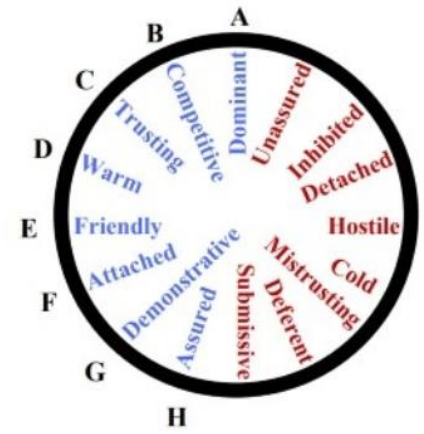
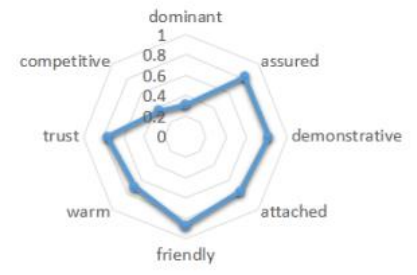
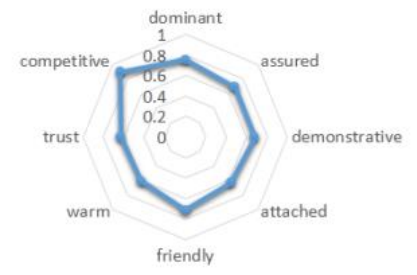
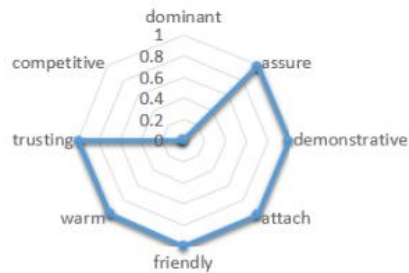
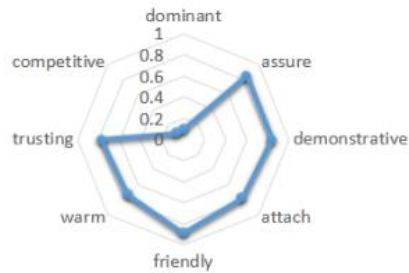


Visual Attention for Object Detection





Social Relation Trait Discovery from Visual LifeLog Data



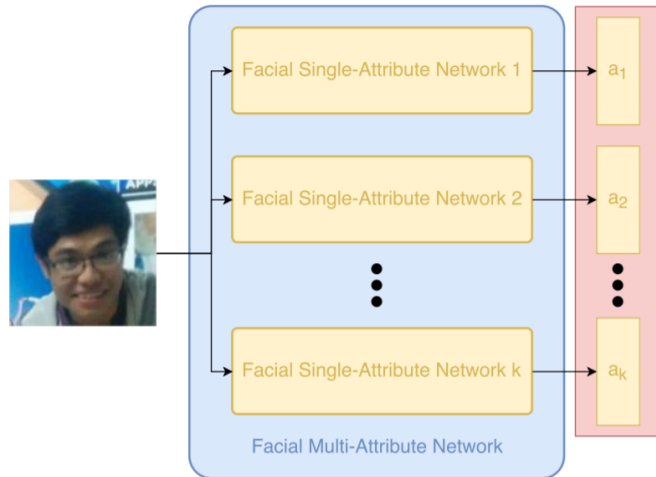
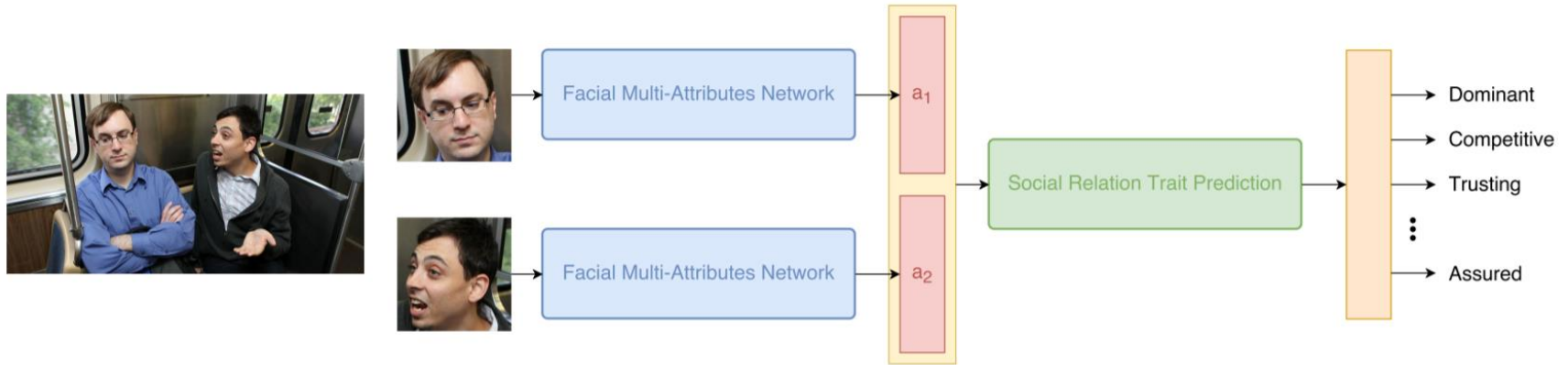
Interpersonal Circle (Kiesler, 1983)



Social Relation Trait Discovery from Visual LifeLog Data



Facial Multi-Attribute Framework: Siamese Structure



Facial Single-Attribute Network



THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE



Find lost items,
retrieve or verify memories
by **searching daily logs**

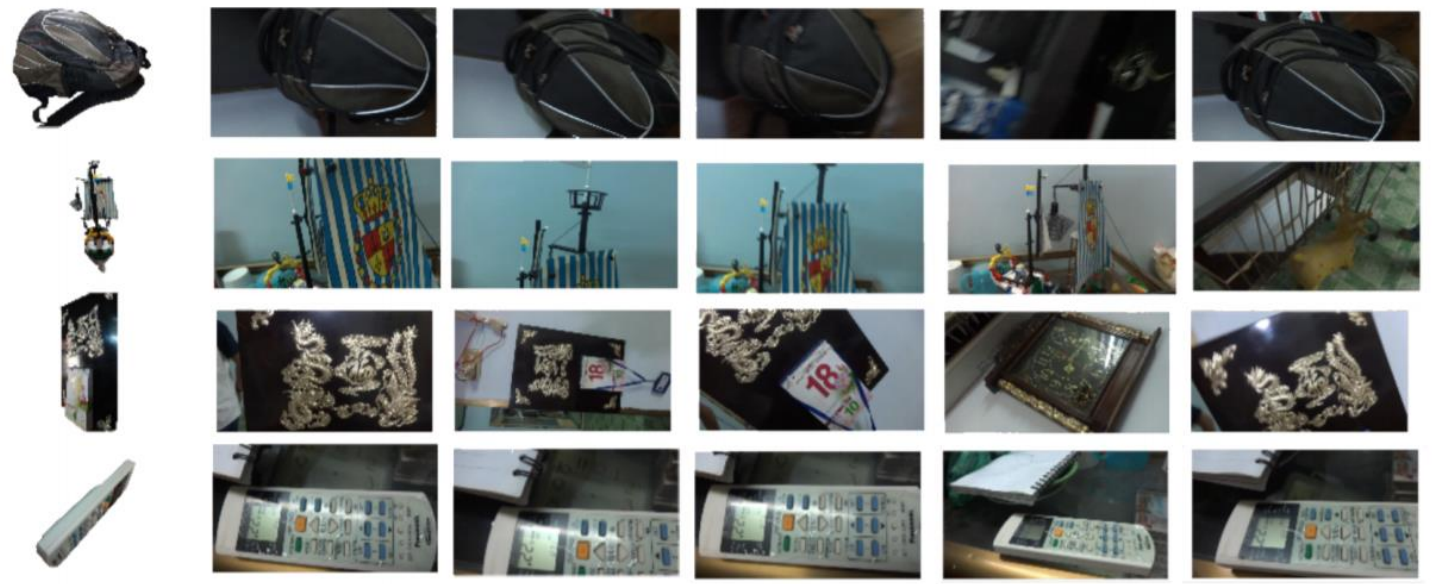




Where is my lost item?

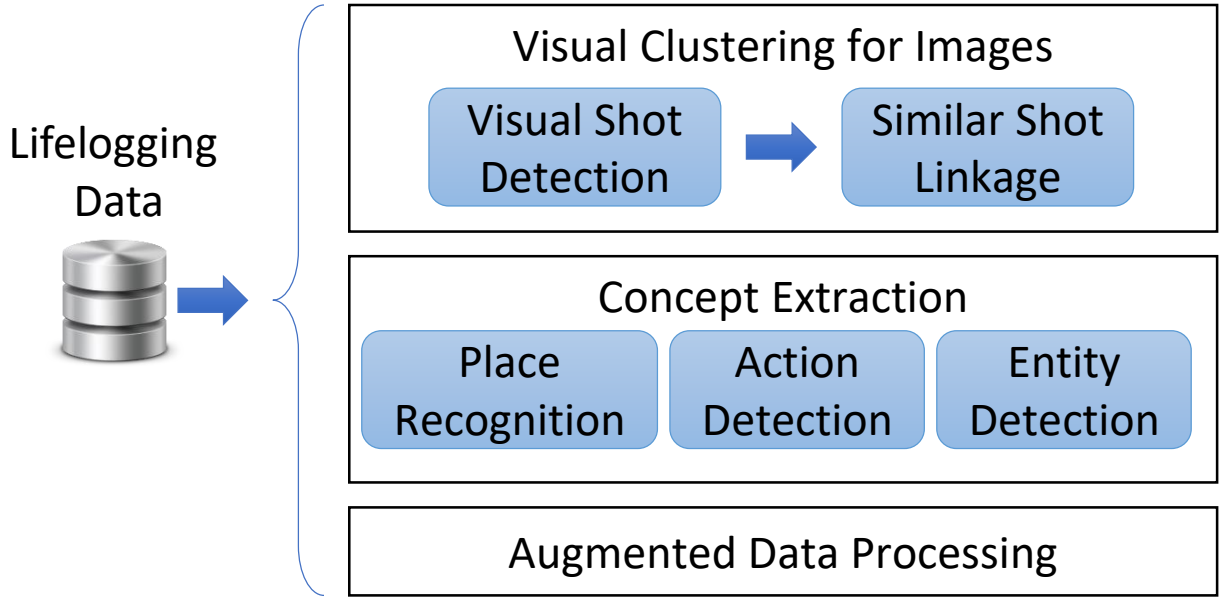


When did I last see this item?
Where is my lost item?
Maybe I have seen this item, but when and where?





Lifelogging Data Pre-processing





Visual Clustering for Images



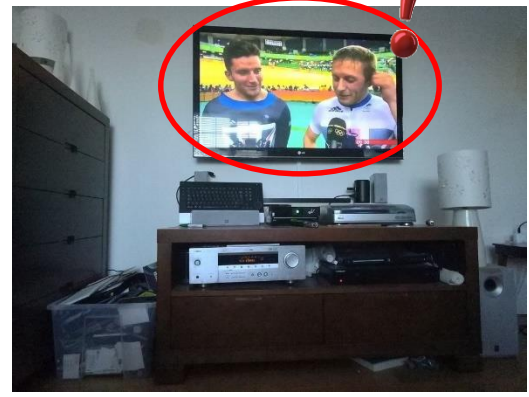
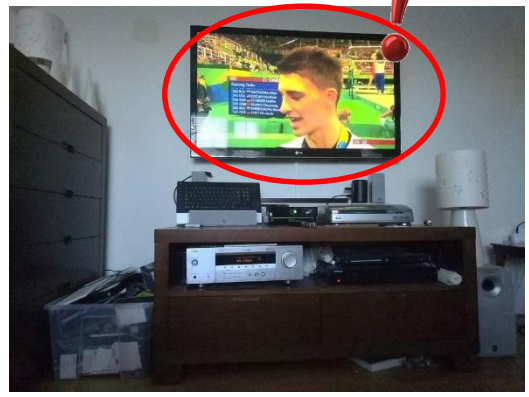
Frame t



Frame $t+1$

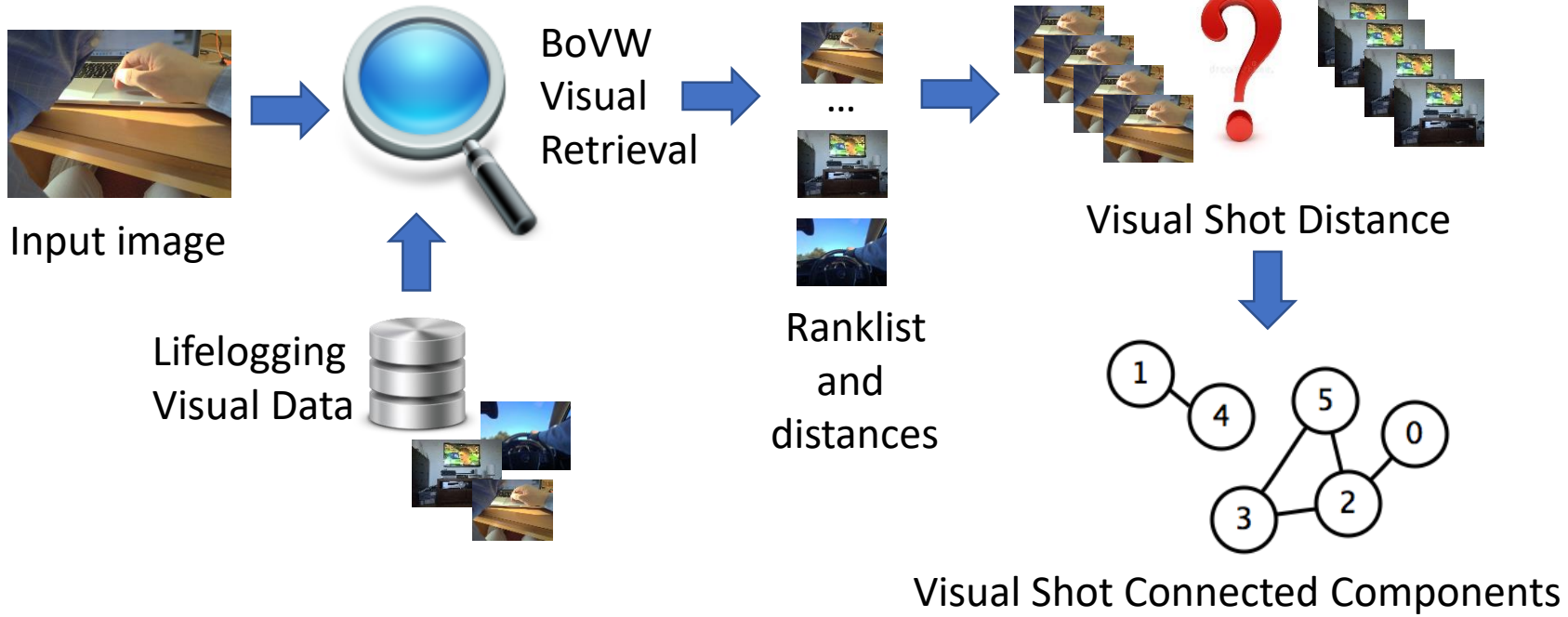


Magnitude of optical flow vectors (with FlowNet2.0)





Visual Shot Clustering

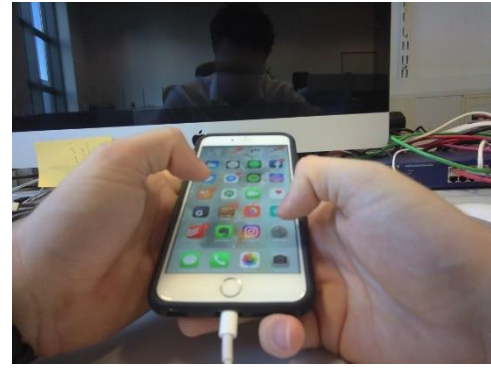
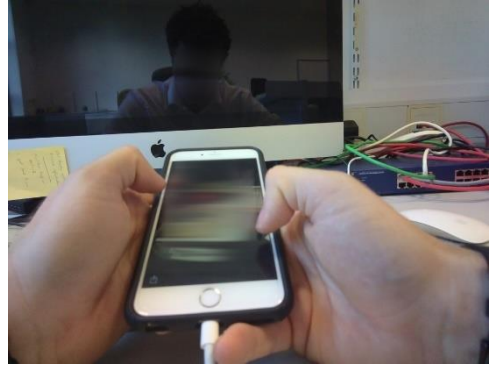




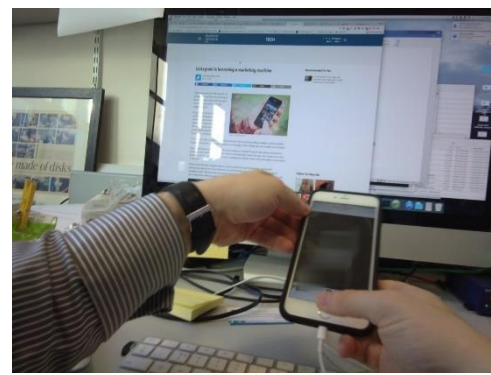
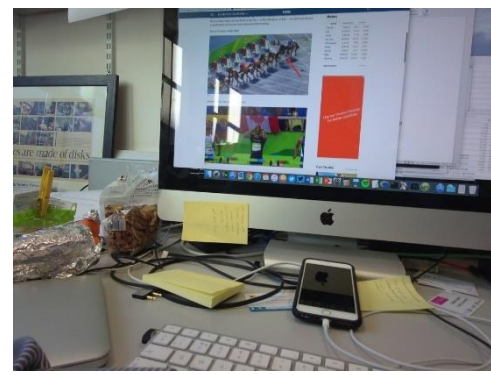
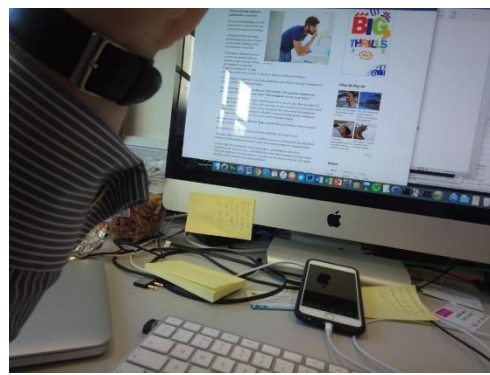
Visual Shot Clustering



August 15, 2016

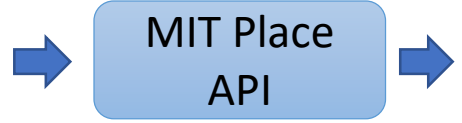


August 16, 2016

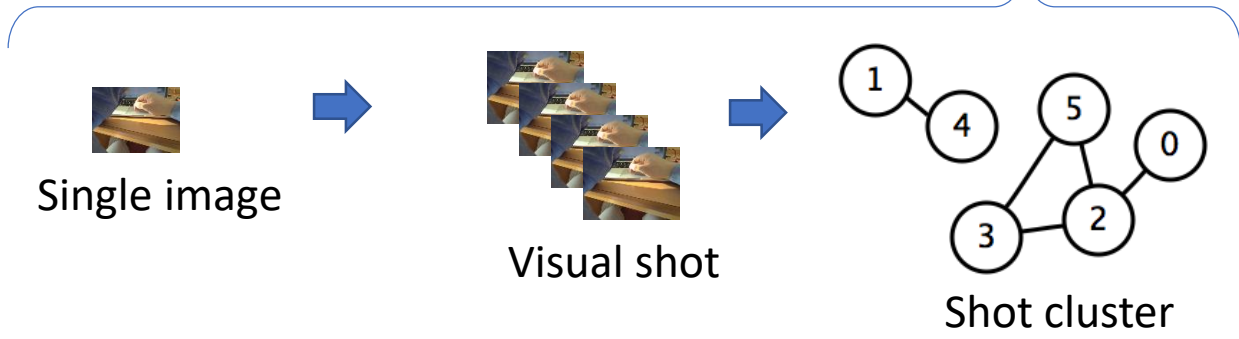




Scene Category and Attributes



- Location information
- Environment type
 - Scene category
 - Scene attributes





Scene Category and Attributes



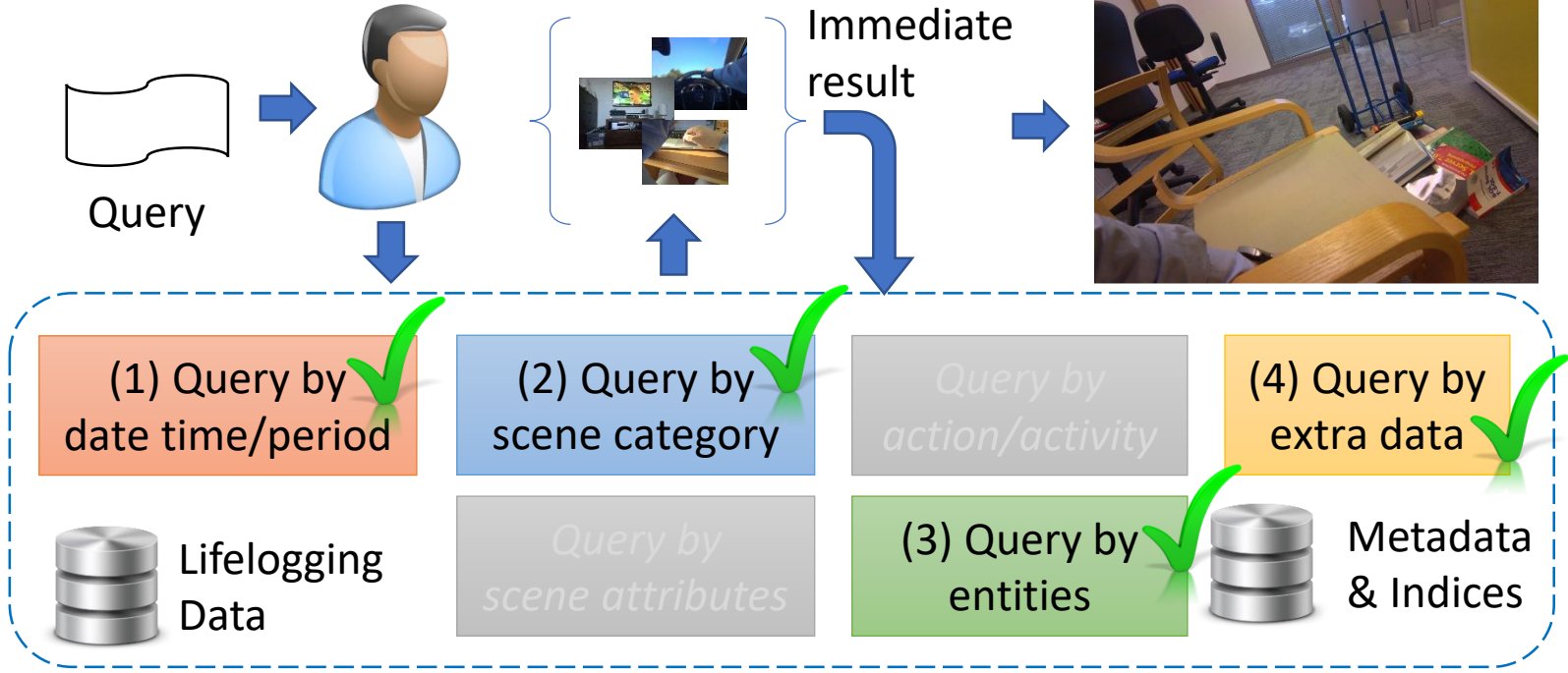
(a) home_theater (b) coffee_shop, fastfood_restaurant (c) car_interior



Lifelogging Retrieval



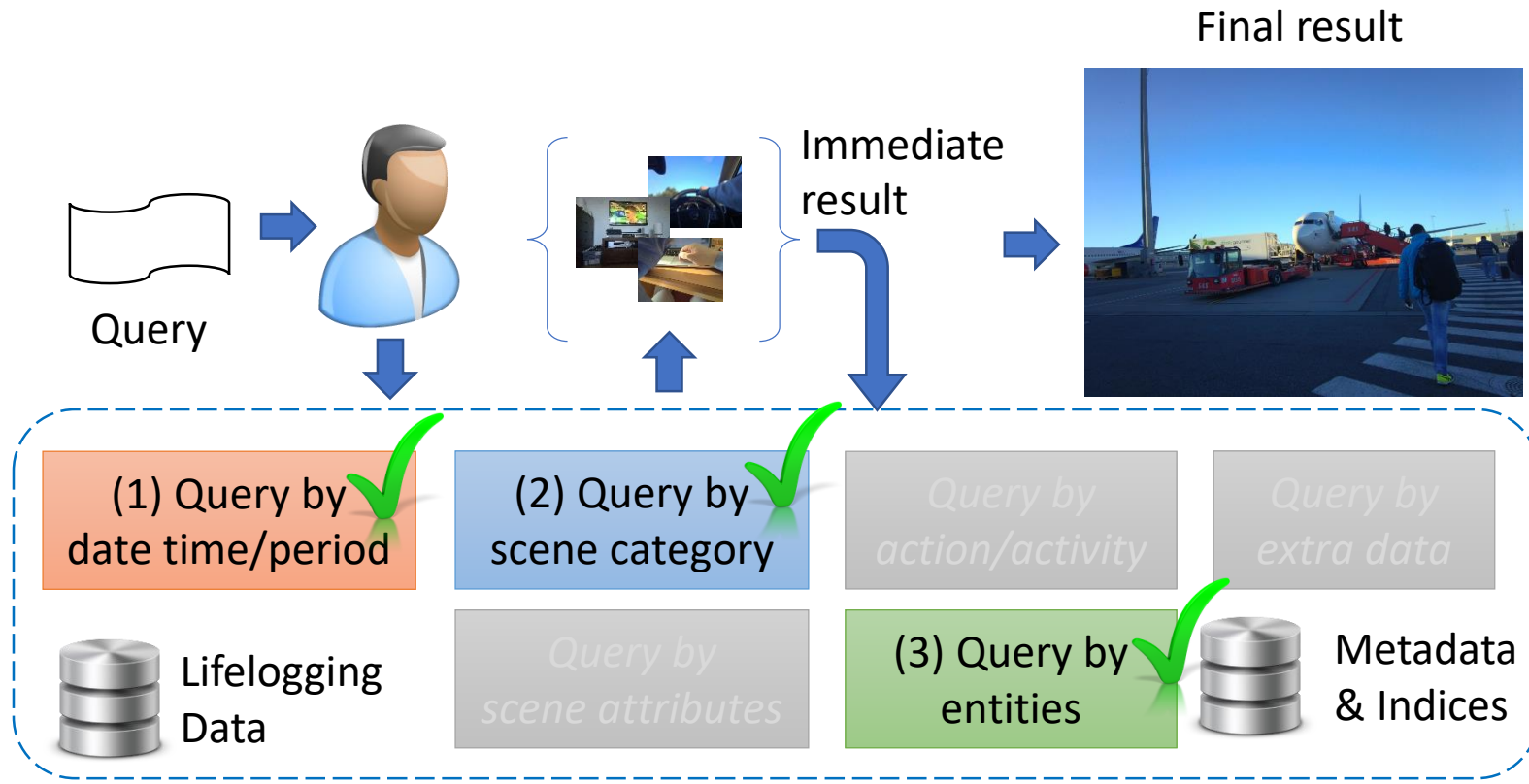
Final result



*"I am building a **chair** that is wooden in the **late afternoon**.
 I am at work, in an **office environment**, beside a yellow partition **wall**.
 There are plastic **plants** on the partition **wall**.
Books and a **trolley** can be seen behind me on the ground. Since I am engaged in physical activities, my heart-rate has raised above **100bpm**."*



Lifelogging Retrieval



*"I am walking out to an **airplane** across the **airport apron**.
 I stayed in an **airport hotel** on the previous **night** before checking out and walking a short distance to the **airport**.
 The weather is very nice, but cold, with a clear blue **sky**.
 There is a **man** walking to the **airplane** in front of me with a **blue jacket**, **green shoes** and a **black bag**."*



THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE

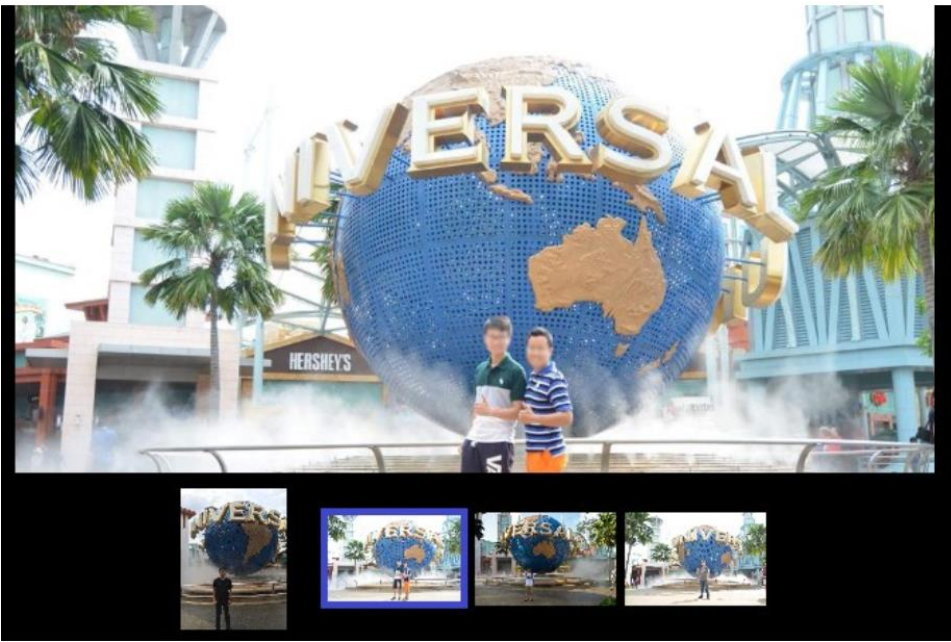
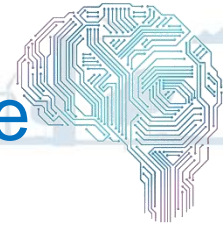


Reminiscence can help people to positively revive past memories and connections with their relatives





NowAndThen: Social Network-based Photo Recommendation for Reminiscence



Automatically retrieve visually similar photos for reminiscence





Personalized Annotation for Photos



#APCS_Party

Automatically retrieve visually similar photos for personalized annotation and indexing



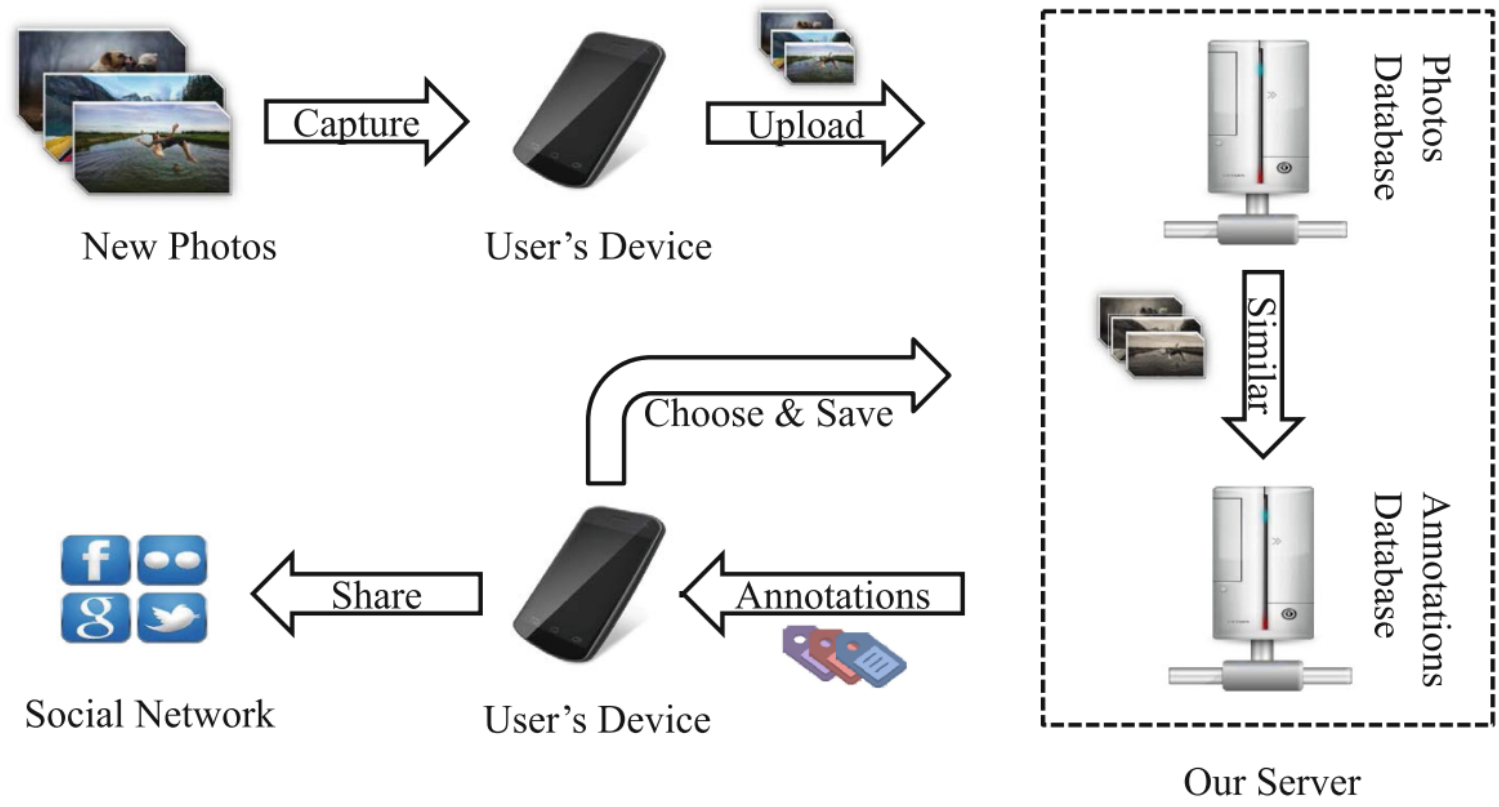
#First_time_in_Singapore



#My_first_Regional

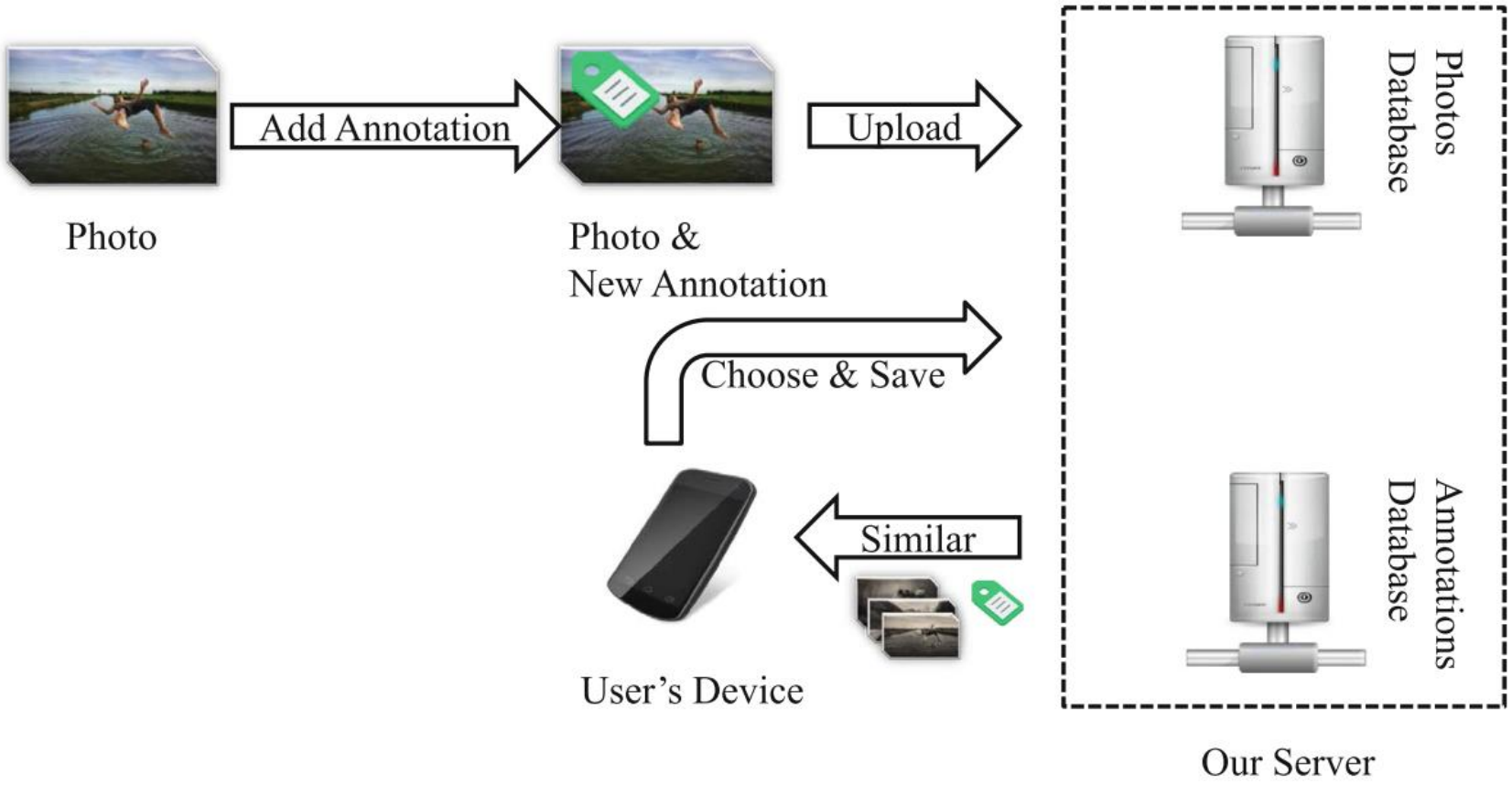


Recommend personalized tags





Learn to annotate photo from samples provided by users





THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE



Detect regular events and anomalies
from surveillance systems or sousveillance archives
for appropriate actions.





Traffic Analysis



NVIDIA AI City Challenge, CVPR 2018



The video clips are from Track 1 of NVIDIA AI City Challenge, CVPR 2018



Challenges in Traffic Videos



Ideal scenario



Dark environment, bad illumination case



Shaking & blurring camera

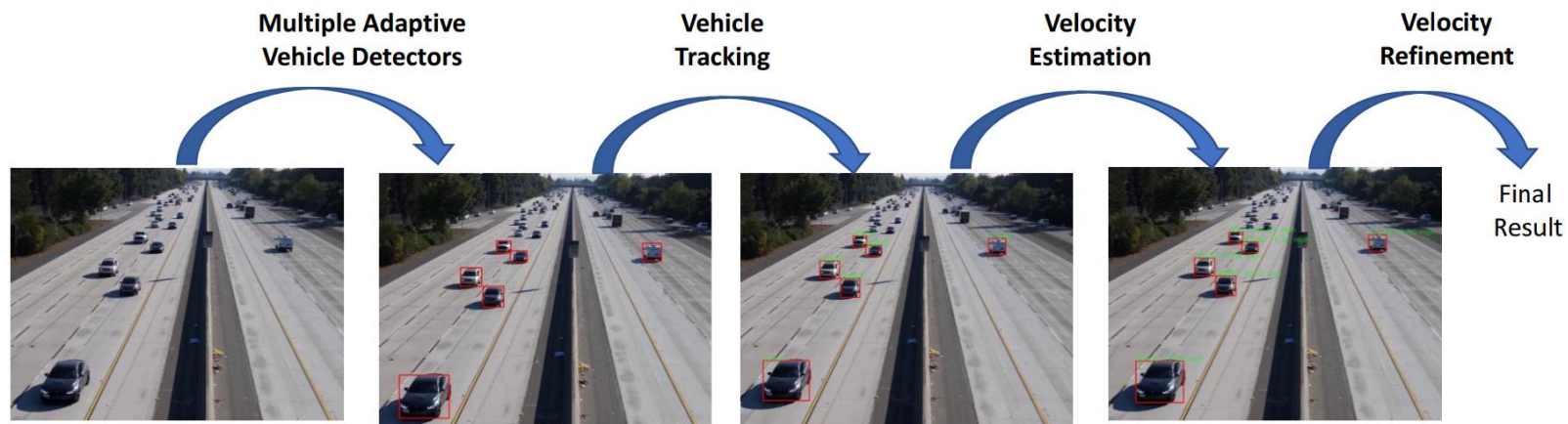


Manually recorded video

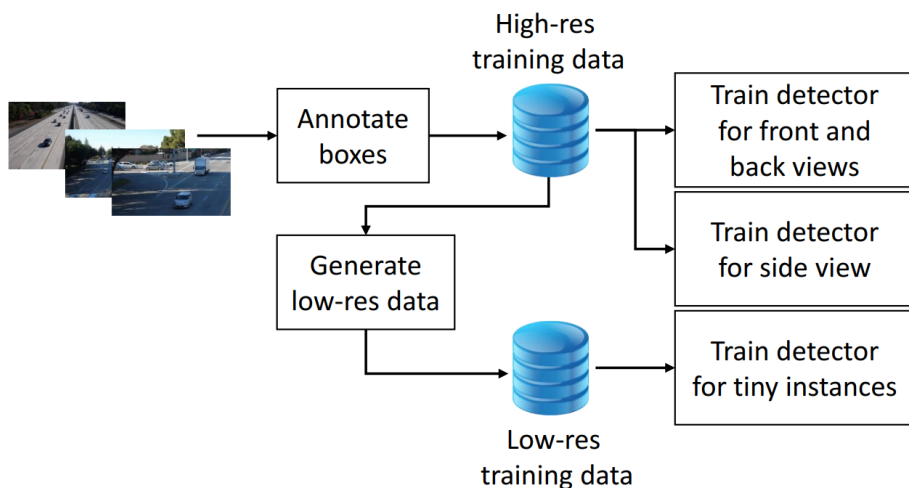
The video clips are from Track 2 of NVIDIA AI City Challenge, CVPR 2018



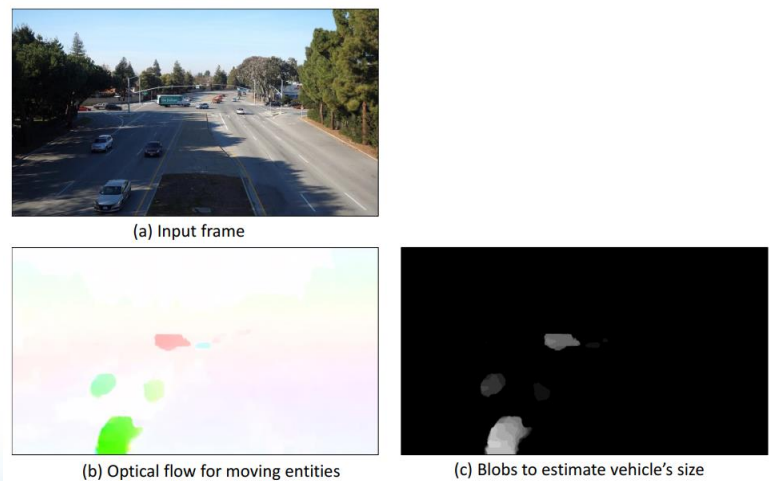
Adaptive Vehicle Detector



Multiple Adaptive Object Detectors



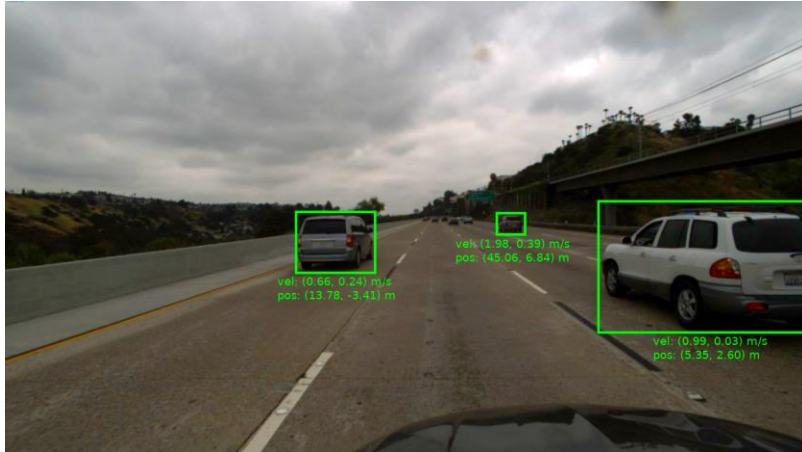
Region-based Adaptive Set of Detectors



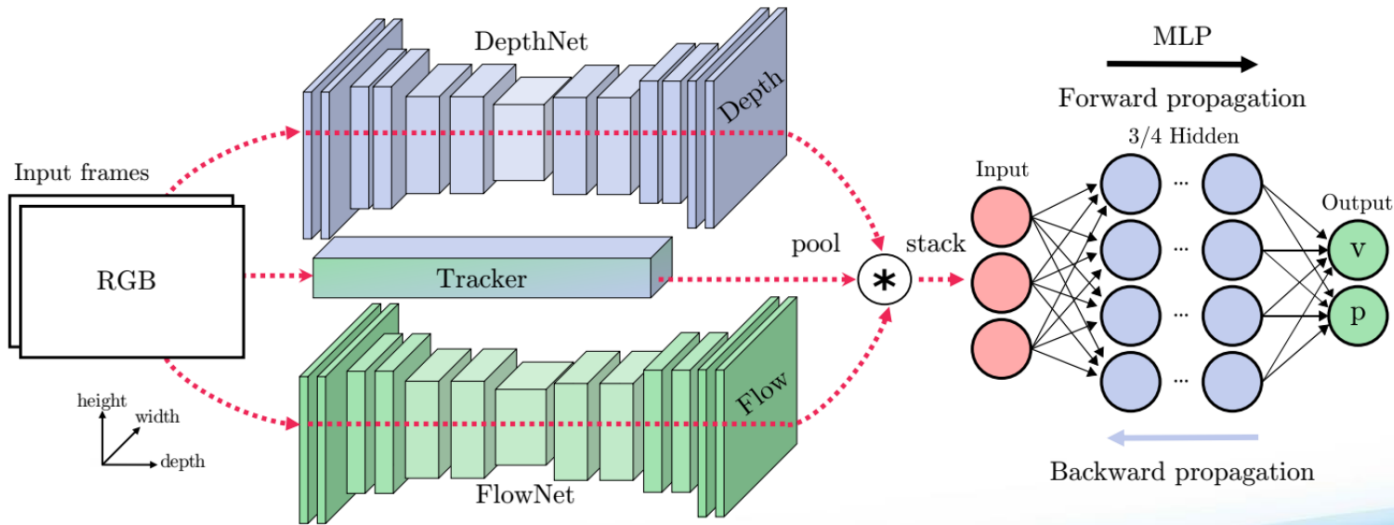
Traffic Flow Analysis with Multiple Adaptive Vehicle Detectors and Velocity Estimation with Landmark-based Scanlines



Velocity Estimation



Video with depth data?
Depth estimation for outdoor environment?





Context Analysis



Supermarket

How many counters should be opened?

- From history logs?
- From current situation?

Student Enrollment to Universities

How many counters should be opened?

- From history logs?
- From current situation?





Context Analysis



Tourism/Attractions

How long should we wait at an attraction?

- From history logs?
- From current situation?





Context Analysis



Power/ Air Conditioner Consumption

Estimate/Predict Power/ Air Conditioner Consumption

- From history logs?
- From current situation?





THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE

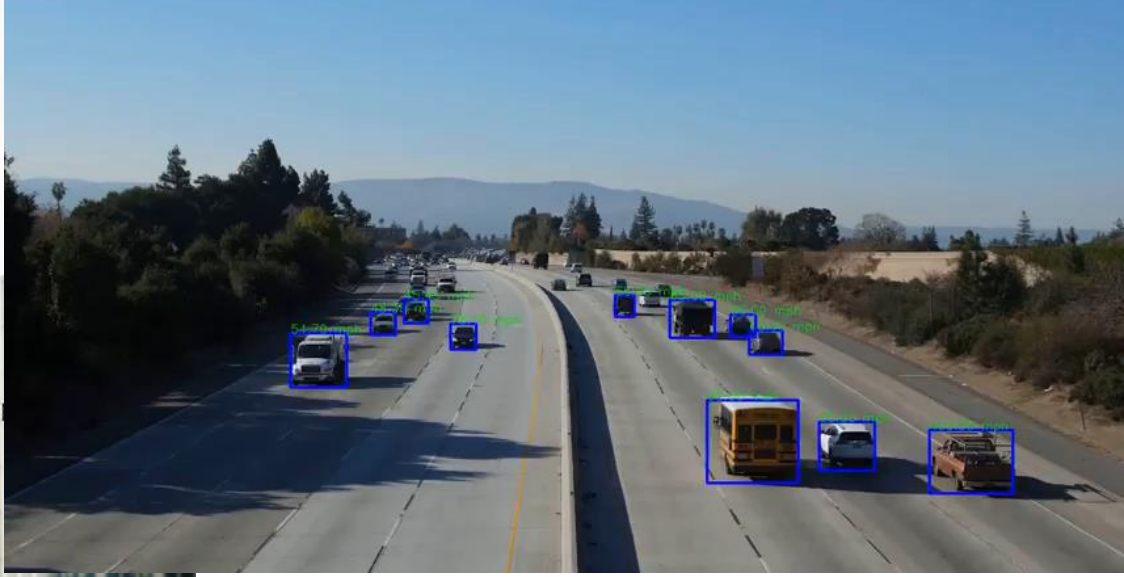


Scene & event simulation
in virtual or mixed reality environments
generated from **real life data**



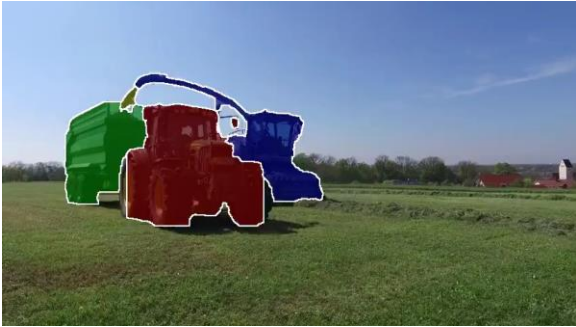


Event Simulation in VR





Scene Synthesis with Semantic Segmentation

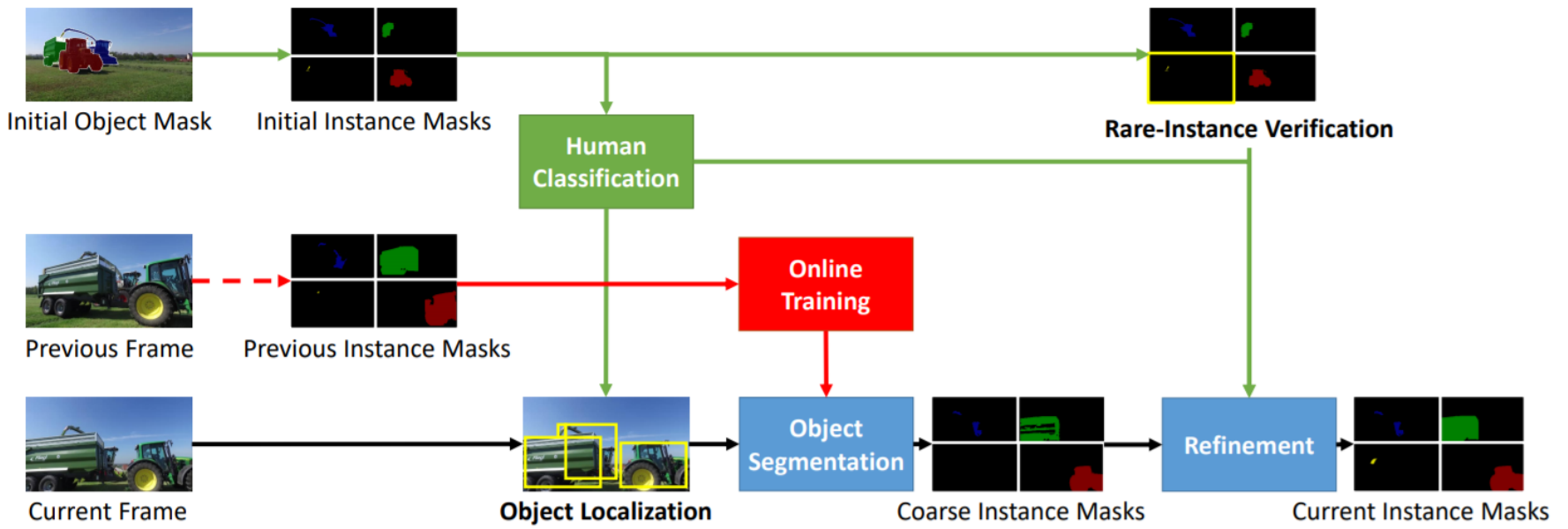


Instance Re-Identification Flow for Video Object Segmentation

Trung-Nghia Le, Khac-Tuan Nguyen, Manh-Hung Nguyen-Phan, That-Vinh Ton, Toan-Anh Nguyen, Xuan-Son Trinh, Quang-Hieu Dinh, Vinh-Tiep Nguyen, Anh-Duc Duong, Akihiro Sugimoto, Tam V. Nguyen, and Minh-Triet Tran, DAVIS Challenge on Semantic Segmentation, CVPR 2017.



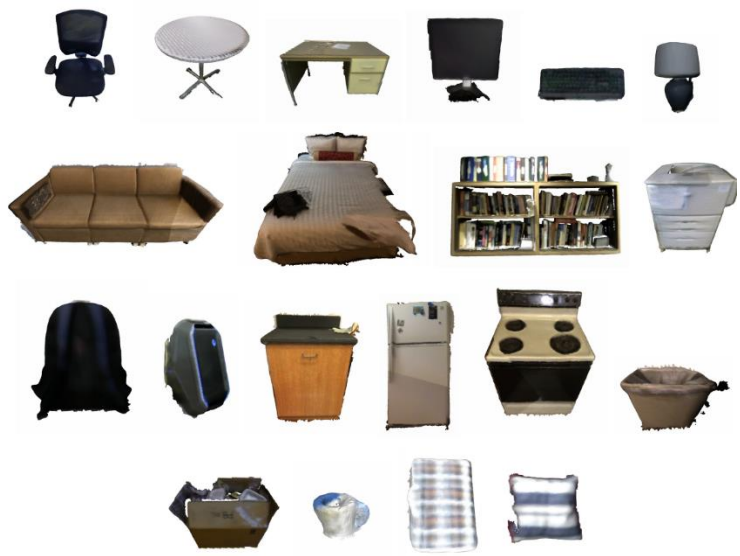
Scene Synthesis with Semantic Segmentation



Instance Re-Identification Flow for Video Object Segmentation

Trung-Nghia Le, Khac-Tuan Nguyen, Manh-Hung Nguyen-Phan, That-Vinh Ton, Toan-Anh Nguyen, Xuan-Son Trinh, Quang-Hieu Dinh, Vinh-Tiep Nguyen, Anh-Duc Duong, Akihiro Sugimoto, Tam V. Nguyen, and Minh-Triet Tran, DAVIS Challenge on Semantic Segmentation, CVPR 2017.

RGB-D to CAD for 3D Virtual Scene Reconstruction/Generation



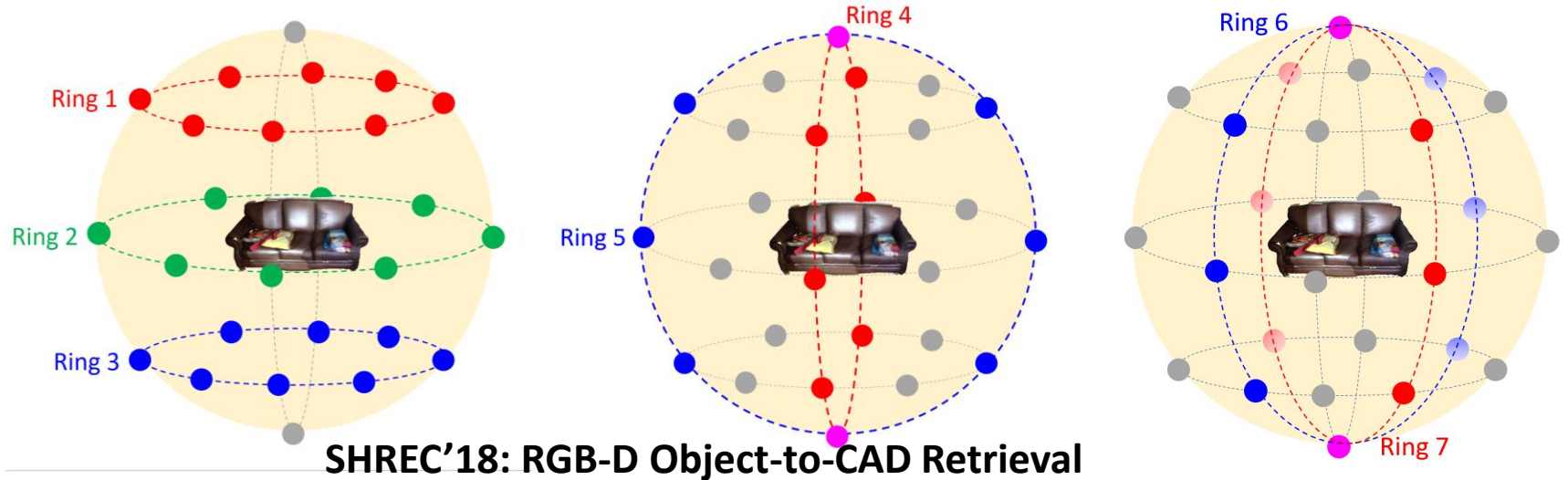
Real Partial 3D Fragments



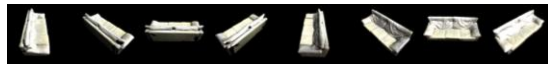
Virtual Ideal 3D Models



RGB-D to CAD for 3D Virtual Scene Reconstruction/Generation



View sequence



Saliency Analysis

Ring Classifier

Prediction scores

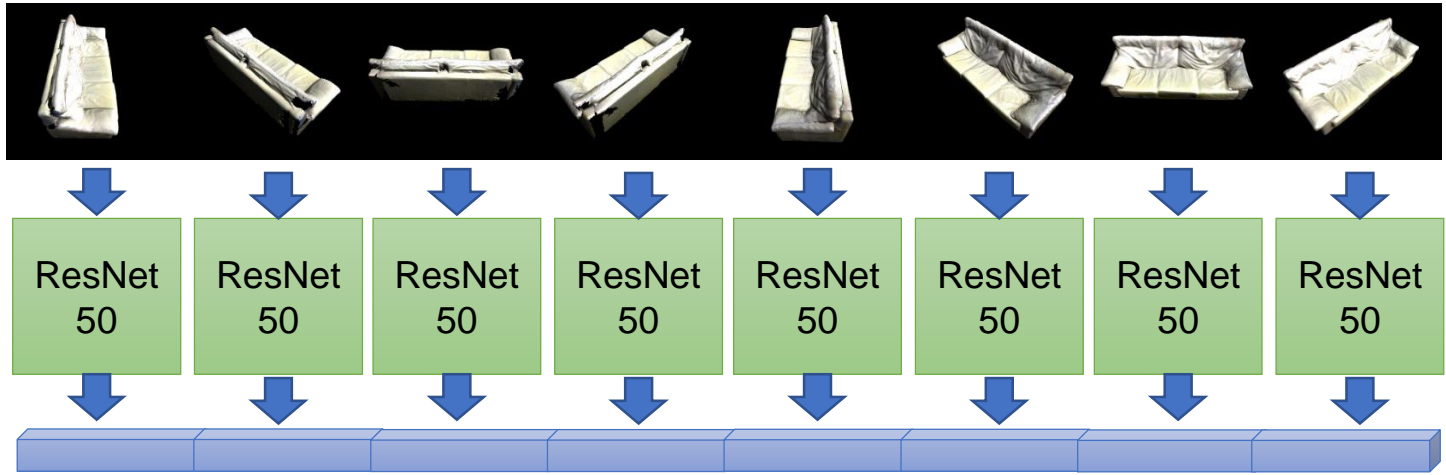
Confidence Evaluation

Confidence score

RGB-D to CAD for 3D Virtual Scene Reconstruction/Generation



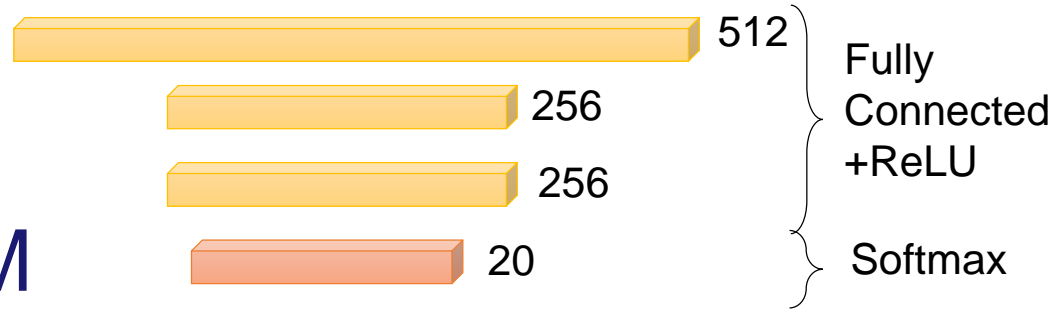
View sequence of the i^{th} view-ring ($1 \leq i \leq 7$)



16384



LSTM





THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE



Conclusion





Daily Activity Log Analysis



❖ Answer:

- Find an item from the digital self
- Validate a memory
- Contextual support

❖ Reflect:

- Quantified-Self Analysis
- Self-discovery

❖ Reminisce:

- Reminiscence Therapy
- Social applications

❖ Remind:

- Contextual Reminders



Multidisciplinary Problems and Approaches



Data Processing

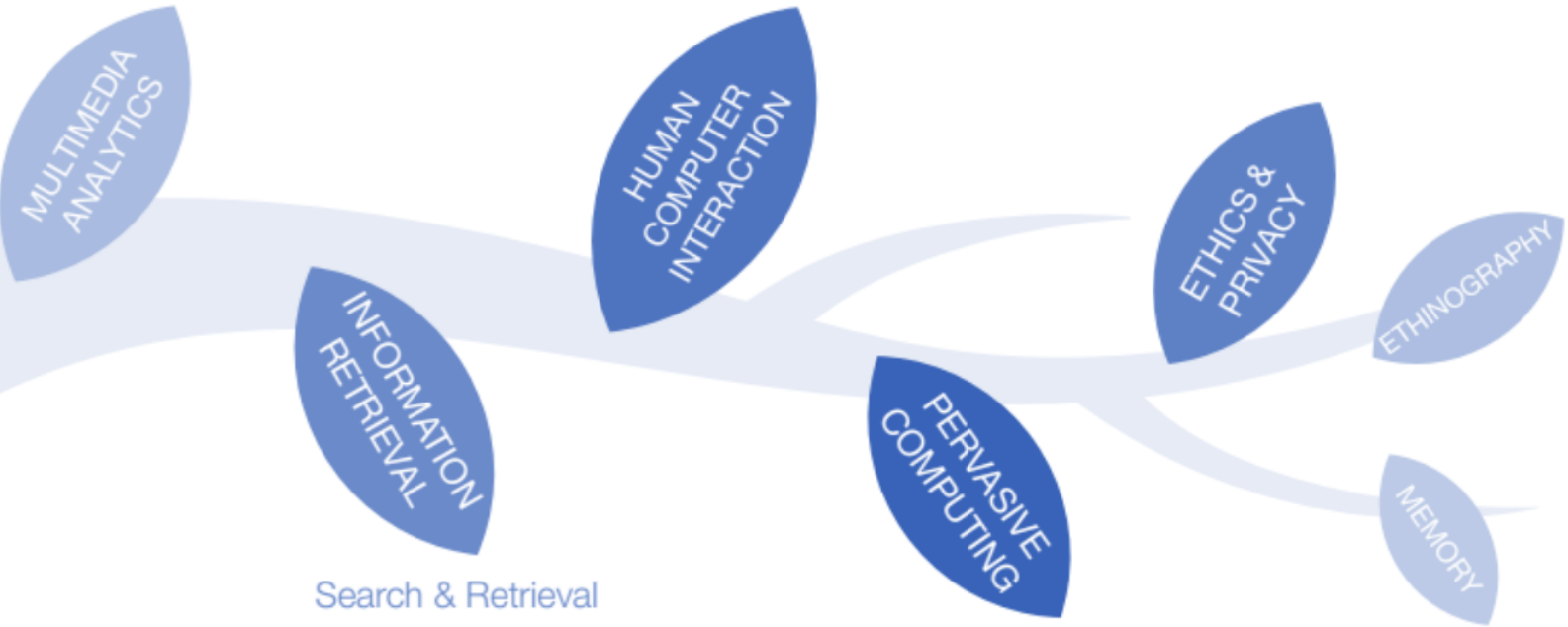
A variety of data, different timings, different accuracies, needing different tools.

User Experience

Develop fixed and ubiquitous capture & access methods for all stakeholders.

Personal Data

The ethics of how to use rich personal data & doing so in a privacy-aware manner.



Search & Retrieval

Scalable & efficient indexing with contextual querying and no defined unit of retrieval.

Anywhere, Anytime

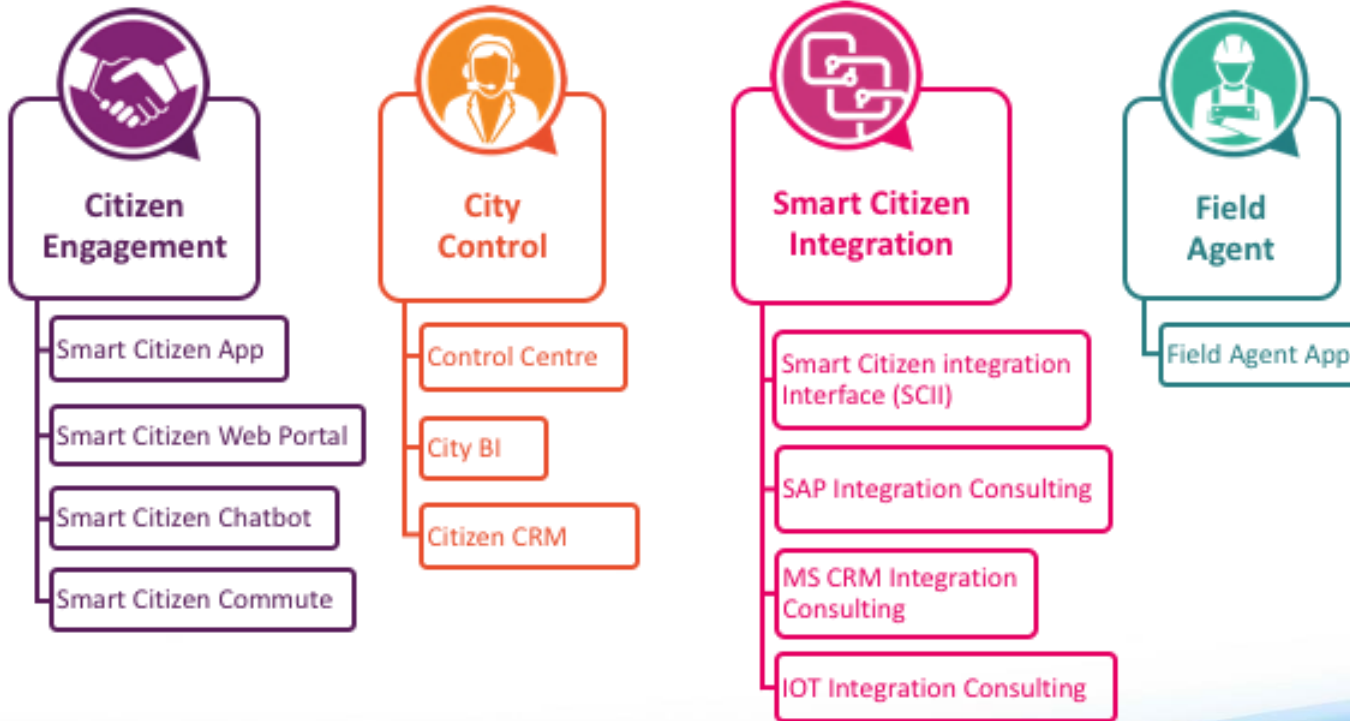
Use-cases need pervasive access and contextual querying.



Collaboration in Various Fields of Research



Lifelog





THE FIRST CONFERENCE ON ARTIFICIAL INTELLIGENCE FOR LIFE



Thank you for your attention

